

- 3 Bioelectric Phenomena in Plants
- 4 Human Heart, EKG, Control, etc.
- 5 Respiration
- 6 Nerves and Muscles

In addition, there are several useful appendices on instrumentation literature and lab manuals, on anesthesia, catheters, and shop-made instruments.

The presentation of the fundamentals is very careful. The figures showing actual components in the laboratory are useful. But there are some omissions. For example, p. 35, capacitive reactance is discussed at some length. Why so skimpy on inductive reactance? Then, resistor code is given, so that a student can recognize a resistor when he/she sees one. Why not present the code for capacitors as well?

The discussion on solid state devices is very good. The chapter on electric safety is excellent. Safety is an important subject. Bioengineers can make a great contribution to health delivery by paying attention to and improving safety measures in hospital practice. Not only electric safety, but also the question of how to prevent human errors in the operation of medical instruments, such as respirators, etc.

If a complaint can be lodged, it is that many illustrative figures are so small that it is very difficult to read. But overall, I find this book excellent.

Modern Cardiovascular Physiology, by Carl R. Honig, 347 + xiii pp., \$15.95 (paperback), Little, Brown & Co., Boston, 1981.

The Human Cardiovascular System – Facts and Concepts, by John T. Shepherd and Paul M. Vanhoutte, 351 + vi pages, \$14.95 (paperback), \$25.00 (cloth), Raven Press, New York, 1979.

These two new textbooks are both excellent, yet they are very difficult in style and approach. The difference in contents can be seen from their major divisions.

Honig:

- 1 Properties of Cardiovascular Muscles
- 2 Hemodynamics
- 3 Capillaries, Filtration, and Determinants of Transport
- 4 Regional Circulation and Vasomotor Mechanisms
- 5 Regulation by Central Nervous System

Shepherd and Vanhoutte:

- 1 Components of Cardiovascular System
- 2 Dynamic Behavior
- 3 Local Control of Cardiovascular Function
- 4 Neurohumoral Regulation
- 5 Integrated Responses of the Cardiovascular System to Stress
- 6 Pharmacodynamics
- 7 Hypertension Hyperreactivity
- 8 Diseases of the Endothelium, Supporting Structures, and Active Components of the Cardiac and Vascular Walls
- 9 Circulation in the Fetus, Changes at Birth, and Congenital Heart Disease
- 10 Measurement of Heart Function, Vascular Function and Blood Volume

Thus Shepherd and Vanhoutte is more clinically oriented, but Honig contains clinical applications, too, though not as much. The discussion of pharmacodynamics and pathological situations and their management in Shepherd and Vanhoutte is very good; it makes delightful reading as well as being informative.

Both books have in common an emphasis on the systems

concept. Both display the complexity of the cardiovascular system. Both stress the importance of the transport phenomena. Yet the styles are different. Honig has more mathematical formulas, whereas Shepherd and Vanhoutte has more diagrams of molecular structures. Honig leans more on the physics side of the problem. Shepherd and Vanhoutte leans more on the chemical side. Honig stresses rheology, and considers it to be one of the important advances made in the past 20 years; Shepherd and Vanhoutte does not mention that word. Honig spends considerable space on microcirculation; Shepherd and Vanhoutte are very brief on that. Honig asks his reader to do exercises to solve the problems presented in the book, and considers that as an integral part of the text; Shepherd and Vanhoutte offer no problems for solution. On the other hand, the superior chapters on neurohumoral regulation and pharmacodynamics are not matched by Honig.

I like both books. An instructor selecting a text book can choose according to his/her inclination and judgment as to what is needed by the student.

Structure and Function of the Circulation, Vol. 1., edited by Colin J. Schwartz, Nicholas T. Werthessen, and Stewart Wolf, 819 pp., \$75, Plenum Press, New York and London, 1980.

This book contains 11 chapters. I found them all well written and informative. The contents are as follows:

- 1 The Arteries in Greco-Roman Medicine, by C. R. S. Harris, 20 pp.
- 2 Embryology of the Human Arterial System, by W. Pallie, 74 pp.
- 3 Functional Morphology of Arteries During Fetal and Post-natal Development, by W. W. Meyer, S. Z. Walsh, and J. Lind, 286 pp.
- 4 Abdominal Visceral Circulation in Man, by E. A. Edwards, 44 pp.
- 5 Arterial Circulation of the Extremities, by H. Haimovici, 62 pp.
- 6 Biology of the Collateral Circulation, by D. E. Strandness, Jr., 50 pp.
- 7 Measurement of Blood Pressure, Blood Flow, and Resistance to Blood Flow in the Systemic Circulation, by J. Ludbrook, 50 pp.
- 8 Regulation of Arterial Blood Flow, Pressure, and Resistance in the Systemic Circulation, by J. Ludbrook, 44 pp.
- 9 The Anatomy of the Renal Circulation, by K. Solez and R. H. Heptinstall, 30 pp.
- 10 The Renal Circulation: Physiology and Hormonal Control, by K. Solez and R. H. Heptinstall, 68 pp.
- 11 The Innervation of Arteries, by G. Burnstock, J. H. Chamley, and G. R. Campbell, 40 pp.
- 12 The Blood Supply to Nerves, by W. Paille, 36 pp.

Dr. Harris presents in the first chapter a very interesting account of the Greco-Roman conception of circulation. A mistaken idea, based on a wrongly interpreted observation of fact, prevented the ancients from discovering that blood circulates. The observation was that in dissection of corpses the arteries were found to be patent and filled with air. The interpretation was that the arteries supply the gases to the organs. Following this mistaken idea, all the brilliant achievements of Greek and Roman anatomy were not able to yield a correct assessment of the function of circulation. This discussion is a fitting introduction to the chapters that follow.

The second chapter is devoted to arteriogenesis. It is an excellent presentation with many colored illustrations. The third chapter, by Meyer, Walsh and Lind, treats the morphology of arteries during fetal and post-natal development. It is 286 pages long. The details of the morphology are presented in an unhurried manner. It is one of the most comprehensive treatments of this subject. In today's world of publications, in which the publisher and the editors always try to get the authors to shorten their manuscripts, the appearance of this chapter is a delight. It gives me much pleasure to read the details of the structures of the arterial walls. Information like this is needed if bioengineers are ever going to

construct a mathematical model of the arteries. As it stands, these pieces of information are not yet in sufficiently quantitative form to be used directly for mathematical modeling. But this is an important first step.

The same can be said of the five chapters on circulation in the abdominal viscera, the extremities, the kidney, the nerves, and the innervations of arteries. The unhurried presentation is delightful.

Dr. Strandness's chapter on collateral circulation and Dr. Ludbrook's two chapters on the measurement and regulation of blood pressure, flow, and resistance are brief, but superior.

I believe that this book supplies a lot of information which is needed by the bioengineer and thus should be in the bioengineer's reference library.

Cardiac Dynamics, edited by Jan Baan, Alexander C. Arntzenius, and Edward L. Yellin, 549 pp., \$81.60, Martinus Nijhoff, Hague/Boston/London, 1980.

This is a volume of the proceedings of a meeting on cardiac dynamics sponsored by the Cardiovascular System Dynamics Society. The meeting was held in Leiden, in August 1978. The volume contains 48 papers written by over 100 authors. It is divided into the following sections:

- 1 Cardiac muscle mechanics: from the fiber down to the sarcomere
- 2 Cardiac chamber dynamics: from the fiber up to the myocardium
- 3 Pump function and filling: interaction with the low pressure system
- 4 Pump function and ejection: interaction with systemic load and coronary perfusion
- 5 Measuring cardiac performance: aims and validity of invasive and noninvasive measurement
- 6 Energy losses: hemodynamics of valves

Thus, the book covers the entire field of cardiac dynamics. There are many good papers in this volume. Most of them are reviews of recent work with comments on the author's perspectives. Everyone is concise, and thus serves well for the purpose of quick review of the field.

The book opens with a provocative chapter by B. R. Jewell, who doubted the existence of a separation between inotropic state and preload. He suggests that the activation depends on the muscle length. Tei Keurs in another article supports his idea. Huntsman and Joseph, in Chapter 1.5, conclude that the contractility parameters are independent of preload only at muscle lengths larger than 85 percent of Lumax.

In the opening paper for Section 2, Sagawa discusses similarities and discrepancies between force-length relations of isolated muscle on the one hand and end-systolic pressure-volume relations of the ventricles on the other.

I find this book very useful for the bioengineer.

Biomechanics of Medical Devices, edited by Dhanjoo N. Ghista, 667 pp., \$95 (price is 20 percent higher outside the U.S. and Canada), Marcel Dekker, New York and Basel, 1981.

The intensity of research and rapid advances made in the field of biomechanics is evident in this book. There are thirteen chapters:

Part 1: Monitoring Devices

- 1 Blood Pressure Monitoring Catheter Manometer Systems: Response to Pressure Variations, Design Calibration, and Testing Analyses, by Kenneth E. Latimer and Eric van Vollenhoven, p. 1
- 2 Mechanics and Analysis of Tonometry Procedures by Finite Element Modeling of the Corneoscleral Shell, by Albert S. Kobayashi, p. 7

3 Human Locomotion: Data Monitoring and Processing—Clinical Applications, by Morris Milner, p. 123

4 Respiratory Sounds: Monitoring Instrumentation and Clinical Application, by F. Thomas Wooten and William W. Waring, p. 157

5 Function, Physics, and Calibration of Stethoscopes, by Kenneth E. Latimer and Eric van Vollenhoven, p. 183

Part 2: Prostheses and Implants

6 The Design Development, In Vitro Testing, and Performance of an Optimal Aortic Valve Prosthesis, by Helmut M. Reul and Dhanjoo N. Ghista, p. 257

7 Optimal Design Parameters and Performance of Arterial Grafts, by Eric Robert Gozna and Allan E. Marble, p. 301

8 Total Hip Prosthesis: Mechanics of Evolution of Optimal Design, by A. J. Clive Lee, p. 325

9 Material Selection for Direct Skeletal Attachment via Tissue Growth, by Samuel F. Hulbert, Jerome J. Klawitter, Stephen J. Morrison, and Richard G. Topazian, p. 371

10 Fluid Flows Around Corneal Contact Lenses and Their Design Implementations, by Isaac Greber and Alexander Dybbs, p. 457

Part 3: Skeletal Correction and Rehabilitative Devices

11 Biomechanical Analysis of Etiology, Kinematics, and Kinetics of Correction Procedures of the Scoliotic Spine, by Augustus A. White, III and Manohar M. Panjabi, p. 491

12 Below-Knee Drop-Foot Braces: Stresses During Use and Evaluation of Design, by Gordon C. Robin, p. 535

13 Design of a Multitask Exoskeletal Walking Device for Paraplegics, by Ali Seireg and Jack G. Grundman, p. 569

From this list it is clear that the various chapters are written by authorities in the respective fields. Of the authors, Kenneth Latimer, from Middlesex, England, has passed away. Latimer coauthored two very good and useful chapters in this book, one on manometer, another on stethoscope. It is a comfort to see that these two common instruments are given the deserved attention. This book is a legacy given by Mr. Latimer to this world; it endears his name to our hearts.

An evidence of some unusual dynamics in the field of medical instrumentation can be perceived from the list of contributors. Of the 21 living authors of the book, 9 changed their affiliations between the times when the manuscripts were delivered and when the book was published. It must mean that the field and the workers in it are changing rapidly.

Dr. Kobayashi's chapter on tonometry, i.e., the measurement of the pressure in the eyeball, which is most important in the diagnosis of glaucoma, is very good. It first reviews the existing empirical and theoretical analyses on the structural responses of the corneoscleral shell due to plunger loadings by Schiotz, applanation, and Mackay-Marg tonometers. These were found to be either based on improper engineering assumptions or too complicated for clinical use. The author then describes a numerical method of solution: the finite element modeling approach using nonlinear elastic properties of the corneoscleral shell. The developed model is then used to estimate the structural response of a cornea with keratoconus for which no experimental or theoretical analysis exists.

Dr. Kobayashi's review and his presentation of the finite elements method is useful. His style is lucid and concise, informative and easily understandable. However, nothing is reported about the clinical applications of this method. Has it been used somewhere? With what kind of success? How can they be used to supplement or improve the instruments currently in use in every ophthalmologist or optometrist's office? The literature cited appears a little old: in a total of 55 references, only 4 were published after 1973, 2 in 1975 and 2 in 1977. Tonometry seems to be a neglected field. As glaucoma is one of the most prevalent serious diseases of the eye, this field deserves more attention.

There are three chapters on locomotion (Chapters 3, 12, and 13), one on spine (Chapter 11), and one on hip prosthesis (Chapter 8). There is one chapter on respiratory sounds (Chapter 4), one chapter on aortic valve (Chapter 6), one on